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ABSTRACT

Educational reform initiatives such as the National Council of Teachers of Mathematics (NCTM) Standards, National Science Education Standards, and Project 2061 provide guidelines to reduce the diversity gap in science and mathematics literacy. Schools are applying these guidelines to classroom practices by posing questions about what changes are feasible given the multiple pressures of today's schools. This digest provides references to successful practices which have increased mathematics and science achievement among diverse student populations. Topics discussed include: (1) Eliminating Tracking, Increasing Expectations and Course Requirements, and Changing Course Content Sequences; (2) Using Technology; (3) Enhancing Life Skills Through Mathematics and Science Literacy; (4) Capitalizing on Cultural Learning Styles and Culturally Relevant Curricula; (5) Engaging Parents as Active Partners; and (6) Increasing Affective and Academic Support for Students. Contains 23 references. (JRH)

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Effective K-12 Practices for Equity

Nancy Murphy, Lead Author

March 1996

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ERIC Clearinghouse for Science, Mathematics, and Environmental Education DIGEST

Educational reform initiatives such as the NCTM Standards, National Science Education Standards, and Project 2061 provide guidelines to reduce the diversity gap in science and mathematics literacy. Schools are applying these guidelines to classroom practice, posing questions about what changes are feasible given the multiple pressures on today's schools. This digest provides references to successful practices which have increased mathematics and science achievement among diverse student populations.

Eliminating Tracking, Increasing Expectations and Course Requirements, and Changing Course Content Sequences

In most public schools non-white students have been more likely to end up in a "tracked" route that did not include college preparatory mathematics and science courses in high school. Many programs are challenging that practice with good results by preparing all students for the college preparatory track (Silva, Moses, Rivers, & Johnson, 1990), placing all students in gifted classes (Hanson, Walker, & Flom, 1995), detracking mathematics courses and standardizing the curriculum during the first few weeks until mobility lessens (Miner, 1995), and integrating the content of high school mathematics classes (Kysh, 1995). Schools are implementing innovative assessment practices which make expectations and assessment criteria explicit for teachers and students (Waters, Burger, & Burger, 1995).

Using Technology

When access to computers is equitable, technology improves opportunities for diverse student populations. Computer-based labs and data analysis allow students to connect mathematics and science to real issues in their communities (Sheppo, Hartsfield, Ruff, Jones & Holinga, 1994; Smith, 1989). The use of interactive software for geometry, algebra, and calculus empowered students to use fundamental ideas, multiple representations, and technology-assisted methods to reason about applied problems and mathematical ideas (Heid & Zbiek, 1995). Videodiscs and CD-ROMs provide clearer imagery and examples of science and mathematics topics (Rock & Cummings, 1994).

Enhancing Life Skills Through Mathematics and Science Literacy

Schools are using projects and exhibitions in which students experience connected, applied mathematics and science. Some teach mathematics and science entirely through student-generated business projects (Benedict, 1992). Meaning-centered, constructivist methods are helping students master science, mathematics, and language acquisition skills (Minicucci, Berman, McLeod, Nelson, & Woodworth, 1995).

Capitalizing on Cultural Learning Styles and Culturally Relevant Curricula

Students bring different cultural patterns to the classroom through language use, space and time interactions, problem-solving techniques, and interactional styles. They also bring different prior experiences and frames of reference for imagining concrete applications of abstract ideas. Schools are providing instruction that supports these varied cultural styles and experiences by establishing all-girls science classes (Pollina, 1995), using culturally-relevant materials (Matthews & Smith, 1994), creating options where students can choose between options that celebrate diversity or provide cultural immersion (Piper, 1994).

Addressing Staffing Needs

Equitable schools show that it is important to help teachers obtain the knowledge and experience to connect mathematics and science in relevant ways to the lives of their students. Teachers need to know how children think in mathematics in order to make appropriate instructional decisions based on what each child knows and can do (Carey, Fennema, Carpenter & Franke, 1995). Teachers with personal experience in applied science and mathematics can apply their experiences to promote connected and integrated learning (Minicucci et al., 1995; Phillips & Ebrahimi, 1993). Equally important is empowering teachers with the ability to make instructional and curricular decisions and to restructure school time for teacher collaboration, exploration, and professional development (Navaez, Jr. 1994; Ohanian, 1993). Other successful behaviors of equitable teachers are including parents as active partners, demanding intellectual rigor and challenge, disciplining without demeaning or abusive behavior, and improving student attendance (Ladson-Billings, 1994).

Engaging Parents as Active Partners

High parental involvement characterizes many successful schools. Some involve parents in all aspects of curriculum decision-making and classroom management (Davis, 1995; Minicucci et al., 1995). Others help families support science and math reasoning at home (Sears & Nedearis, 1992; Campbell, 1994).

Increasing Affective and Academic Support for Students

Many diverse students attribute their success in science and mathematics to a nurturing relationship with an adult who provides high expectations, mentoring, and

support as students delve into the many unknowns of mathematics and science problem solving (Kahle, 1987). This component plus a nurturing school community is helpful for diverse students. Effective schools provide a structure that supports caring teachers and counselors who work together to provide in-class intervention for students in need (Benedict, 1992).

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